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Advances in Veterinary Science

ON another page of this issue we publish, under the heading " In Brief," the first of a fortnightly series of notes, each of which will sum up, in a short space, the advances in various veterinary fields as reported in the world literature.

In these days the flood of scientific papers is such that it is hardly possible for the busy practitioner to keep pace with it; and though THE RECORD regularly publishes Abstracts from a variety of journals, these, naturally, cover a range of subjects rather than concentrating upon one. It is for this reason that the Association's Technical Development Committee has invited the help of a panel of specialists, each of whom has undertaken to review in turn the advances in his own particular field. These contributions will be written in such a form as to interpret scientific findings in terms of practical work in the field. They will relate new knowledge to that already accepted, and suggest both its immediate clinical bearing and the indications for future work.

It is hoped that members in practice will welcome this new series of notes, which will be printed each fortnight in the same part of the journal, that is to say, immediately following the principal papers and preceding Current Literature. It is intended that a sufficiently large panel of writers shall be recruited to make " In Brief " a permanent feature of our columns.

With innovations of this kind it is sometimes found that after a promising beginning they tend to peter out. We have, however, enough material in hand for the next six months, while new writers, who have been approached, have indicated their willingness to contribute to what they regard as an important addition to the contents of this journal.

Even within comparatively recent years the increase in the quality and volume of veterinary literature has been as remarkable as it is gratifying. Within the comparatively restricted orbit of this Association, for example, output has increased substantially. As lately as 1950, eight papers were read at Congress; last year there were 18. The minutes of past Editorial Committees show occasions when scientific material of acceptable standard had to be eagerly sought. To-day we suffer, if anything, an embarrassing volume of work proferred for publication, despite the fact that the number of our pages has increased by some 20 per cent. in the past two years. Ancillary publications are growing in number also, and it is pleasant to envisage the possibility of the British Veterinary Association becoming, in an increasing degree, a notable centre of published veterinary learning and experience.

All this, however, must inevitably add to the labours of the veterinary surgeon in practice, for to keep up to date demands from him a continually increasing effort. It is his right to look to his own journal for guidance and help in this regard, and it is in this spirit that the new series of informatory notes is to be published. May we, however, remind clinicians of the valuable, indeed the indispensable, help they can give to each other by contributing, in the form of short notes or items of correspondence, more regularly to these columns?

There is a traditional expression, " the art and science of veterinary surgery." We are able to publish a fair selection from the science; but accounts of the art can be provided by the clinician alone.

In this connexion we may, perhaps, remind clinicians of the William Hunting Awards which were announced at the turn of the year. The idea of these Awards has already attracted clinical papers of quality; and more—indeed many more—would be most welcome.

Myelography in the Cat

BY

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CATS have been found to suffer from paraplegia and hindquarters' paresis without any evidence of an infectious or traumatic cause. The paresis appears to develop fairly suddenly in the younger mature cat but is of more insidious onset in the older animal.

The symptoms are often comparable with those of the milder disc protusion lesions in dogs and, in these cases, the cats may make a complete spontaneous recovery. By comparison with the dog, however, it is remarkable that there is so little radiographic evidence in the cat of such spinal skeletal abnormalities as osteoarthritis and enchondrosis intervertebralis. It appears therefore that if a cord pressure lesion does exist in the cat, myelography, to which no references in the literature so far can be found, is likely to be the best aid to diagnosis.

In the case to be described iodised ethyl esters of fatty acids of poppyseed oil* were used as the radio-opaque medium.

To facilitate gravitation of the medium in the neural canal the anaesthetised animal was kept on a wooden slope (see photograph).

Subject

Castrated male cat, aged three years.

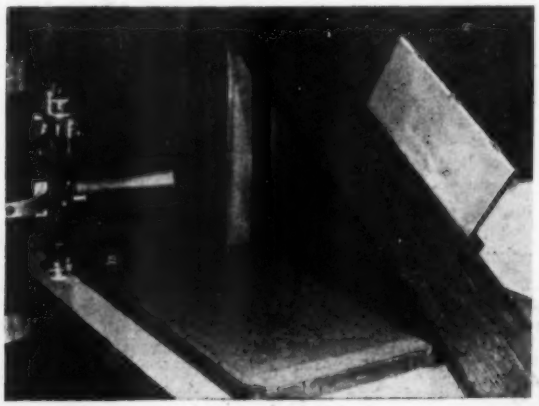
History

The cat was found to be paralysed in the hindquarters on attempting to rise 22/11/55.

Symptoms

Almost complete paraplegia when examined two hours later. There was pain in the region of the thoraco-lumbar junction. Under thiopentone anaesthesia a normal lateral spinal radiograph was taken. This revealed a calcified intervertebral disc L1 to L2, a condition so far unique in our experience (Fig. 1). Pain subsided and disappeared within five days. During the following three months progress was slow and marked paresis was still present. A lateral radiograph 16/1/56 showed no signs of the calcified disc and gave a result similar to Fig. 2.

Myelography was undertaken 28/2/56.



The inclined wooden slope in position.

* "Neo-Hydriol" Fluid (May & Baker).

Technique

Nembutal anaesthesia was induced and the cat suspended prone on the inclined plane of the apparatus as shown. The exposure given for each film was 58 kV, 250 mA, 0.2 sec.: at a distance of 36 inches, using a stationary Lysholm grid and Kodak Blue Brand film with High Definition intensifying screens (Fig. 2). This is the control film of the nembutalised cat taken prior to the injection of the opaque medium. The cat was removed from the apparatus and put on its right side. The occipito-atlantal region was clipped and cleansed. Two sterile 1-c.c. syringes, a 10/10 mm. 15 mm. hypodermic needle, and the Neo-Hydriol were brought to blood heat. The occipito-atlantal joint was flexed and the needle on the syringe entered into the cisterna magna. One ml. of cerebro-spinal fluid was drawn off, the syringe disconnected and one ml. of the opaque substance was injected quickly. The needle was withdrawn and the cat replaced immediately on the apparatus. Exposures were made at 10 minutes after the injection (Fig. 3 and—five minutes later—Fig. 4). The Neo-Hydriol can be seen progressing along the neural canal. No discernible impediment to the flow was noticed. Recovery from the anaesthesia was normal and no change in symptoms as a result of the myelography was noticed within 16 weeks. A continuous very slow improvement proceeds.

Comments

The cause of the paresis in this case must remain obscure. We find that the most important factor which may spoil successful visualisation is insufficient warming of the solution before injecting. This severely slows the rate of flow and causes the substance to globulate. The rate of flow, nevertheless, appears to vary with the individual patient and we find that it is best to make the first exposure about seven minutes after injection of the Neo-Hydriol fluid. Immediate development is then desirable and judging on the vertebra reached it can be calculated when the next film should be exposed. The time taken for the fluid to gravitate posteriorly has varied from a quarter to one hour.

Summary

A technique of myelography in the cat is explained and a specific case of paresis quoted.

Acknowledgments:—To Mr. G. C. Knight for helpful advice and encouragement; and to Mr. J. S. Wilkinson who constructed the apparatus and Miss E. M. Harrod for the radiographs.

Reference

DOUGLAS, S. W. *Vet. Rec.* **67.** 75–78.

FIG. 1.—Lateral radiograph showing a calcified intervertebral disc.

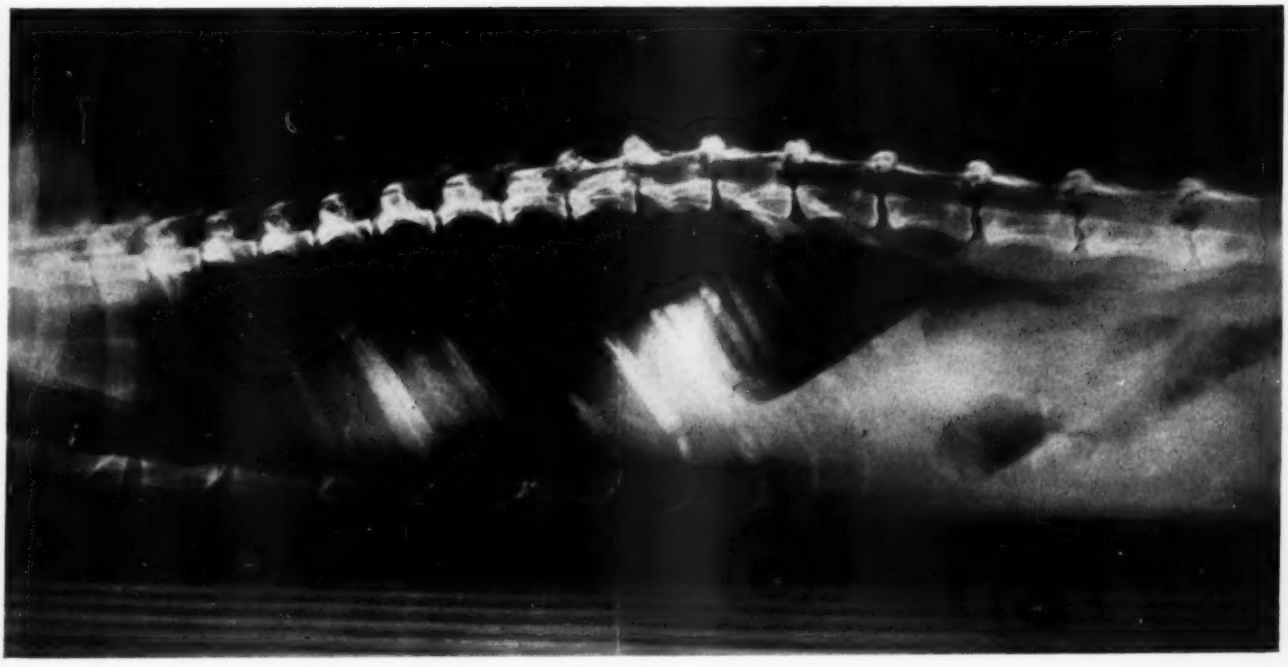


FIG. 2.—The control and before injection of Neo Hydriol.

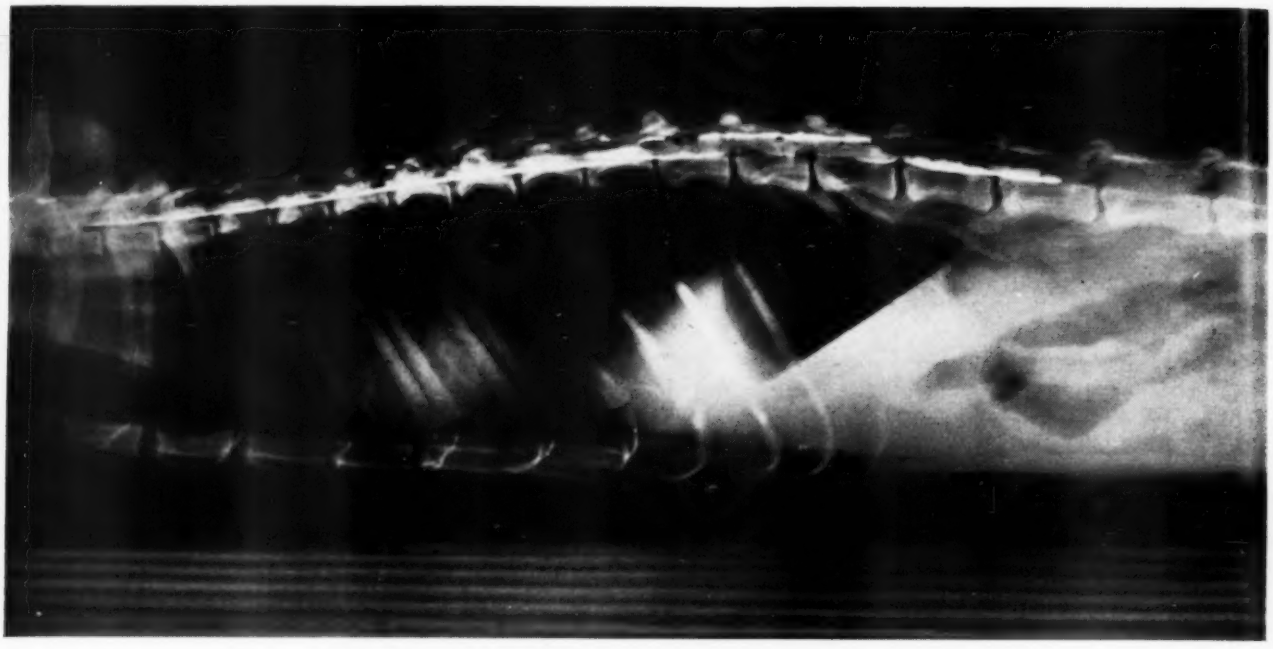


FIG. 3.—Ten minutes after injection into the neural canal.

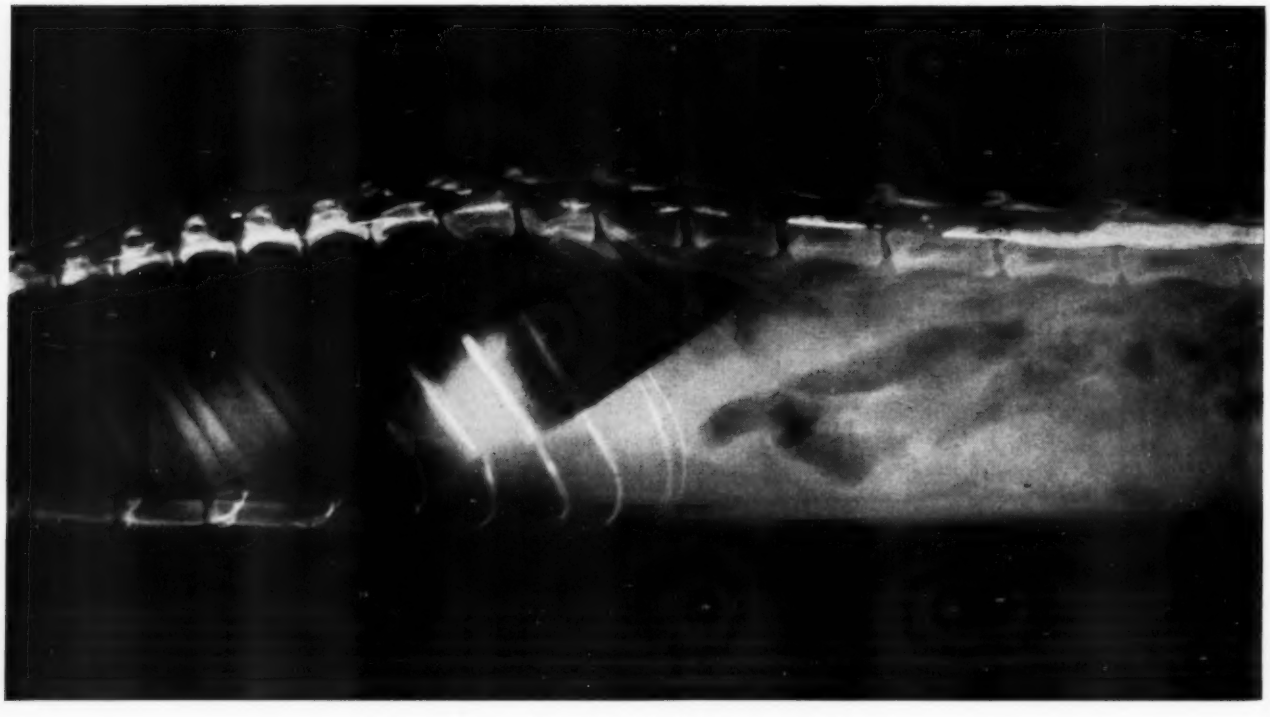


FIG. 4.—Fifteen minutes after injection into the neural canal.

Some Observations on Nematodirus Disease in Northumberland and Durham

BY

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AND

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Introduction

IN recent years considerable losses in the lamb flocks of the North East and border counties have been caused by an acute disease associated with a high intestinal burden of worms of the genus *Nematodirus*. The disease was described by Kingsbury (1953) who reported an incidence of up to 75 per cent. of flocks affected in 1951, with a death rate of 10 per cent. not uncommon. The species involved were stated to be *N. battus* and *N. filicollis*. A third species, *N. spathiger*, is relatively uncommon in this area, but is considered to be responsible for a similar condition in lambs in the U.S.A. (Welch, 1930; Kates & Turner, 1951). Losses in sheep up to two years old in S. Africa have also been attributed to *N. spathiger* (Ryksen, 1939). In view of the scarcity of detailed and published information regarding this condition, the following account is presented of the main features of the disease as it has appeared in Northumberland and Durham during the years 1951–55. Information has been drawn from laboratory records of carcases received at the Newcastle Veterinary Investigation Centre, together with records of visits made in connection with these losses. The figures drawn from laboratory records obviously fluctuate with factors other than the true disease incidence, but they do indicate certain definite trends.

Description of Disease

Seasonal Incidence

Table I shows the first and last dates on which *Nematodirus* disease was confirmed in the years 1951–55 inclusive, and Fig. 1 shows the distribution of cases received in 1951 and 1954 when losses were most severe. It can be seen that the disease occurs over a very restricted season, the majority of deaths occurring during June. The severity of the disease shows some variation from year to year, both in the number of flocks affected and the mortality rates, but the length and timing of the season remain relatively constant.

TABLE I

NUMBERS AND DISTRIBUTION OF DEATHS

Year	Total number of deaths attributed to *Nematodirus*	Total number of sheep under six months examined	First case received	Last case received
1951	25	96	June 11th	July 6th
1952	10	104	May 27th	„ 16th
1953	19	143	June 15th	„ 7th
1954	59	160	May 25th	„ 7th
1955	20	105	„ 17th	„ 5th

Animals Affected

The breeds in which the disease was most commonly encountered were the half-bred (Border Leicester × Cheviot) and the mule (Leicester × Blackface), but these are the most popular local breeds for other than hill farms. The acute disease has never been encountered in pure hill flocks, and was always associated with semi-intensive grazing. Adult sheep were never affected, the disease always being restricted to the lamb crop. The age of lambs affected varied from six weeks to five months, the majority being between 6 and 12 weeks old.

Symptoms, Mortality and Morbidity

The onset of disease was sudden, the first signs noticed by the owner being a "loss of bloom" and unthriftiness. A high proportion of the lamb flock showed a profuse diarrhoea and deaths began from two days to two weeks after the beginning of the outbreak. The animals rapidly became extremely dehydrated, the wool became rough, the belly "tucked up" and the eyes markedly sunken. Deaths continued over a period of up to three weeks, after which the survivors gradually improved, scouring ceased and in most cases the lambs reached normal condition in one to two months. In a few cases, however, the survivors have remained stunted until autumn. Usually the whole lamb flock was affected to greater or lesser degree, the average mortality rate in the flocks investigated in 1955 being 5 to 6 per cent. In 1954, however, when a larger number of outbreaks was reported, the disease appeared to be more severe and losses of 10 to 20 per cent. were common. In the

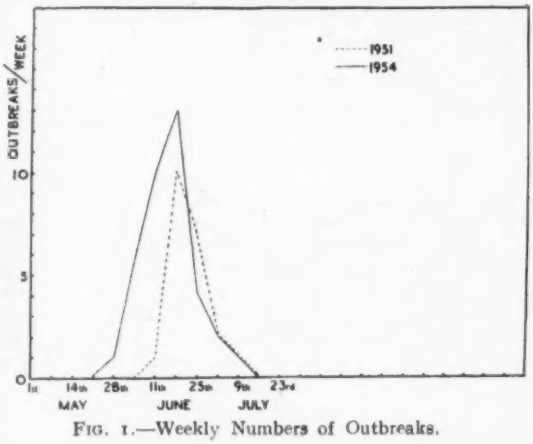

FIG. 1.—Weekly Numbers of Outbreaks.

consideration of carcases sent in to the laboratory, as a general rule, a count of 10,000 *Nematodirus* worms was considered diagnostic in association with the above findings.

In a number of cases, faeces egg counts were carried out on affected flocks during the clinical outbreak. In very few samples did the faeces egg count exceed 3,000 e.p.g. and a general average of 600 e.p.g. was recorded. Faeces from the rectum of five lambs which had died of the disease contained an average of 1,000 e.p.g.

Post-mortem Findings

Gross and Histological Appearance

These findings were based on the examination of lambs slaughtered *in extremis*. Where carcases were examined some time after death, degenerative changes somewhat resembling those seen in pulpy kidney disease were frequently seen. (See below.) The carcase was generally dehydrated, the eyes sunken, and signs of diarrhoea were always present. Kingsbury (1953) found an acute inflammation of the alimentary tract, including abomasum and caecum, in about half the cases investigated, but in the present investigations the only changes seen were those of a mild catarrhal enteritis, although the presence of blood in the intestine was recorded in three cases in 1951. In two cases intussusception had occurred. A consistent finding was that the mesenteric lymph glands were enlarged, pale and somewhat oedematous. No other lesions were found. Histological examination of the small intestine and mesenteric lymph glands in seven cases showed only mild inflammatory changes, with surface degeneration, lymphocytic infiltration and oedema.

Worm Counts

TABLE II
Nematodirus WORM COUNTS

Adult *Nematodirus* worms present	Number of carcases
10– 20,000	54
20– 30,000	18
30– 40,000	14
40– 50,000	7
50–100,000	23
100–200,000	2

Table II shows the total *Nematodirus* worm counts of 118 lambs. Average counts were about 40,000 worms, and variations occurred between 7,000 and 210,000. On no occasion have other species been completely absent, an average of 2,000 trichostrongyles (mainly *Ostertagia*) being associated with the *Nematodirus* burden, the total of other worms rarely exceeding 4,000. No carcase examined outside the dates indicated in Table I has shown a total *Nematodirus* count exceeding 3,000. In five lambs where the intestines were opened immediately after death, the worms were found to be approximately evenly distributed throughout the small intestine.

Differential counts of female *Nematodirus* worms were carried out on 13 lambs in 1954 and the results are given in Table III.

These results would suggest that in this area *N. battus* is the predominant species but many more observations will have to be made before definite conclusions can be drawn. (In the examination of 19 carcases by Kingsbury (1953) a differential count of 95 per cent. *N. battus* to 5 per cent. *N. filicollis* was recorded with an average count of 11,600 worms.)

Associated Conditions

Tapeworms (both *M. expansa* and *M. benedeni*) were frequently present in considerable quantities and may have influenced the course of the disease. Coccidial oocysts were not seen in significant numbers in any of these cases, though it is understood that they have been frequently seen in large numbers in the Westmorland-Cumberland area. (Heath—private communication.)

In 36 out of a total of 133 carcases examined, the *post-mortem* appearance resembled pulpy kidney disease with haemorrhages on the epicardium and endocardium, excess pericardial fluid and toxic changes in the liver and kidneys. Neutralisation tests in mice for the presence of *Cl. welchii*, type D toxin, were carried out on these carcases and 19 gave positive results. Seventeen carcases which did not show lesions suggestive of pulpy kidney were tested with negative results.

It is considered that the two diseases may often be associated and that the heavy worm infestation may provide conditions in the intestine conducive to the formation of *Cl. welchii* toxins.

TABLE III
DIFFERENTIAL WORM COUNTS

Total *Nematodirus* worm count	Percentage males	Percentage *N. battus* females	Percentage *N. filicollis* females	Approximate numbers of other *Trichostrongylidae* predominantly *Ostertagia*
93,000	72	28	0	3,000
10,000	68	32	0	1,000
23,000	39	58	3	2,000
23,000	46	48	6	500 (many tapeworms)
20,000	62	32	6	500
23,000	78	16	6	500
30,000	60	32	8	500
14,000	66	26	8	(many tapeworms)
58,000	53	38	9	(" ")
93,000	46	42	12	500
12,000	28	52	20	500
3,000	20	7	63	1,000 (many tapeworms)
5,000	12	8	78	2,000

Table IV summarises these results.

TABLE IV

INCIDENCE OF ASSOCIATED CONDITIONS

N.B.—Toxicity test implies the intravenous injection of mice with 0·3 ml. of filtered intestinal contents

Year	Total carcases examined	Tape-worms present	*Post mortem* resembled pulpy kidney disease	Toxicity test per-formed	Toxin present
1951	25	—	7	9	4
1952	10	—	1	6	1
1953	19	4	5	6	0
1954	59	16	19	22	13
1955	20	5	4	10	1
Total	133	25	36	53	19

Grazing History

Forty-two affected farms were visited and detailed histories obtained as far as possible. Invariably it was found that during the four weeks preceding the outbreak, the flock had grazed pasture which carried sheep the previous year. Usually the land had carried lambs, but exceptionally it was new ley which had only been grazed by hoggs in the previous autumn. Occasionally outbreaks occurred on new leys but invariably the flock had previously grazed on other pasture. No outbreaks occurred entirely on maiden seeds which had not previously carried sheep.

The average stocking rate was one to two ewes and lambs to the acre. Clinical outbreaks are known to have occurred on at least one farm for three consecutive years, but severe outbreaks do not necessarily follow on the same pasture in successive years. In practice such subsidiary factors as normal reseeding operations and changes in weather tend to limit the recurrence. The pastures had usually been rested for at least two to three months in order to provide an "early bite," and were therefore considered "clean." However, outbreaks have occurred on such pastures within four to six weeks of the lambs being turned on to them. In view of the slow rate of development of the larval stages of this genus, the pasture contamination responsible for these outbreaks cannot have originated from the ewes after lambing. The infective larvae of *Nematodirus* spp. have been shown to possess marked powers of resistance to climatic conditions. Kates (1950) and Stamp, Dunn & Watt (1955) have therefore postulated that the pasture contamination responsible for these outbreaks is deposited by the previous year's lamb crop, the eggs or larvae being capable of surviving up to 12 months on pasture. Dosing with anthelmintic drugs was commonly carried out after the first signs were seen and sometimes appeared to precipitate deaths. Of six common drugs known to have been used, the effects in each case were similar and it is thought that dosing had little influence on the course of the disease.

Subsequent History

A number of farms where outbreaks had occurred were re-visited in late November, and faeces samples taken from ewes and lambs. The samples taken from ewes were completely negative for *Nematodirus* eggs in all cases while of 38 samples examined from survivor lambs only five contained any *Nematodirus* eggs, the counts averaging 125 e.p.g.

Eight survivor lambs which had been severely affected were kept under close observation and sampled weekly from early July. No *Nematodirus* eggs were detected after August 25th. One lamb was killed on August 9th and contained 350 *Nematodirus* worms. Another died of general emaciation on August 27th and contained 80 *Nematodirus* worms.

The other six were kept alive for a year and reached normal conditions during the summer grazing. *Post-mortem* examinations then carried out failed to reveal any *Nematodirus* worms or macroscopic lesions.

These results suggest that in most cases the infestation is rapidly and completely thrown off by the surviving lambs.

The Survival of Free Living Stages of *Nematodirus* spp. on Pasture

A study of the grazing history of affected flocks leads to the conclusion that one year's lamb crop is responsible for the pasture contamination leading to infection of the following year's lambs. Kates (1950) reviewed the literature on the survival of larval stages of sheep nematodes, citing a number of authors who reported good survival of *Nematodirus* spp., and concluded that the larval stages of *Nematodirus* are capable of withstanding both summer and winter conditions. These reports, however, are concerned mainly with *N. spathiger* and with the climatic conditions of North America. Boulenger (1915) stated that unhatched infective larvae enclosed in dry faeces remained viable for 20 months and Taylor (1934) reported that *Nematodirus* larvae could survive ploughing and could overwinter, but detailed information is lacking on the survival times of *N. battus* and *N. filicollis* on pasture in this country. The following study was therefore carried out of the survival of the larvae of *Nematodirus* spp. under natural conditions.

Materials and Method

A permanent pasture of 30 acres was grazed by a small flock of 20 half-bred ewes and 40 lambs from May 1st until June 26th, 1954. Frequent faeces sampling for worm eggs was carried out and a heavy pasture contamination with eggs of *Nematodirus* spp. was observed, egg counts for the lambs ranging up to a peak of 1,250 e.p.g. in early June. The counts for the ewes remained low throughout, the highest count recorded being 40 e.p.g. At the end of June the flock was moved and no lambs were allowed to graze this field subsequently. The pasture was grazed by ewes in September-October and again in December but frequent sampling showed that the ewes passed no *Nematodirus* eggs at this time.

Pasture sampling for infective larvae was commenced on March 19th, 1955, the pasture having been free of lambs for eight months. The sampling technique used was that described by Michel & Parfitt (1955) with one modification. These authors collected grass samples by cutting small pinches of grass close to the ground, whereas Crofton (1954), in a discussion of sampling

methods, concluded that more consistent results were obtained by plucking the grass. In the present work, therefore, samples were collected by plucking. Infective larvae of *Nematodirus* spp. could be identified easily by the long sheath tail. The method was checked by the addition of known numbers of larvae to clean grass, a recovery rate of 52 per cent. being obtained which compares with a recovery of 43 per cent. recorded by the original authors. Sampling was carried out weekly from March 15th until July 11th, and then at two- to three-week intervals until October 13th.

Results

The results of sampling expressed as the number of *Nematodirus* larvae per pound of herbage are set out in Fig. 2. Only small numbers of larvae were recovered until May 2nd when a sudden very marked increase occurred, which reached a peak on May 10th of 170 larvae per lb. After this date the number recovered fell steadily through May and June to reach a low level during July, remaining at this low level until October 13th when no larvae were recovered and sampling ceased. Ninety per cent. of the larvae recovered were identified as *N. battus*, the remaining 10 per cent. as *N. filicollis*.

Discussion

The results show that the larval stages of *N. battus* and *N. filicollis* can survive on pasture in the N.E. for at least 11 months and are resistant to both summer and winter conditions, the pasture contamination in this case surviving from the end of June to the following May. The form of the graph is of considerable interest in that it shows a very sudden and most marked increase in available larvae during the period April 20th to May 9th. Kates (1953) showed that following experimental infection of lambs with larvae of *N. spathiger*, a period of two to three weeks elapsed before clinical symptoms appeared. From Table I it may be deduced that the season of *Nematodirus* outbreaks in the N.E. in 1955 extended approximately from mid May to the beginning of July. If allowance is made for a time lag between infection and the onset of disease of the order of that

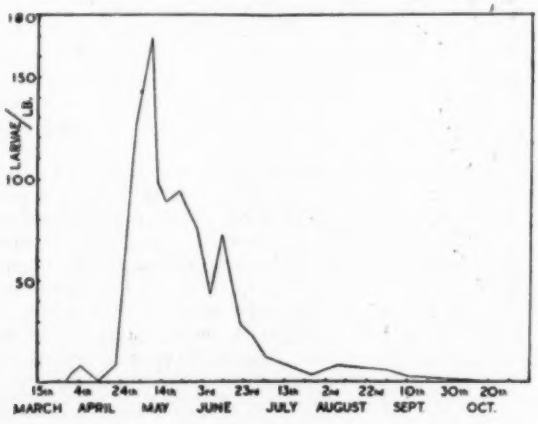

FIG. 2.—Pasture Larval Counts.

demonstrated by Kates, there is a striking correlation between the period of high larval counts and the disease season as reflected by the number of carcases received by the Veterinary Investigation Centre. This close correlation suggests that the observations made on this pasture were typical of those occurring generally in the area, and appears to confirm the suggestion of Stamp, Dunn & Watt that the disease outbreaks are due to the sudden invasion of susceptible lambs by large numbers of larvae. The rapidity with which the larval count rises suggests a sudden onset of larval activity at this time. The factors responsible for initiating this activity are not clear and no obvious conclusions can be drawn from the meteorological data for the area, given in Fig. 3.

From the beginning of May the pasture was grazed by 40 yearling cattle, and the steady decline in numbers of larvae recovered after the peak of May 10th is presumably due, at least in part, to the removal of larvae by the grazing animals. However, in addition, it was noted that after May 10th an increasing proportion of inactive, shrunken larvae was recovered, reaching 50 per cent. of the total on June 13th, and 90 per cent. on July 4th. It would appear, therefore, that the survival time of the active larvae is relatively limited, a 90 per cent. death rate occurring in seven to eight weeks.

It should be emphasised that these results are in the nature of preliminary observation only, but in view of their bearing on the practical control of the disease their presentation at this early stage was considered justified. The results give an indication both of the critical time involved in the uptake of infective larvae and also of the duration of larval activity. Fig. 2 shows a rapid build-up of available larvae towards the end of April and a decline to a low level by the end of June. In order to avoid the disease farmers are recommended not to graze lambs on pasture which carried lambs the previous year. On many farms, however, the available grazing is limited and these contaminated pastures cannot be avoided for more than a few weeks and therefore any information which makes it possible to define the period of maximum danger is of considerable value. Stamp, Dunn & Watt suggest that the danger period is during late May and early June, *i.e.*, the period during which outbreaks occur. The present observations, however, indicate that the danger period for the uptake of infective larvae precedes the actual season of outbreaks by several weeks and in 1955 the danger period as indicated by Fig. 2 extended from late April to mid June, with a maximum risk during May. It is not possible to predict the variations which will occur in different years but Table I suggests that this variation is not marked. It may be concluded therefore that this period from late April until mid June represents the minimum period for which contaminated pastures should be closed to lambs.

The high incidence of pulpy kidney disease as a coincidental infection would emphasise the value of a regular vaccination programme against this disease.

Summary

1. A description of *Nematodirus* disease is given as seen in Northumberland and Durham in the period 1951–55.

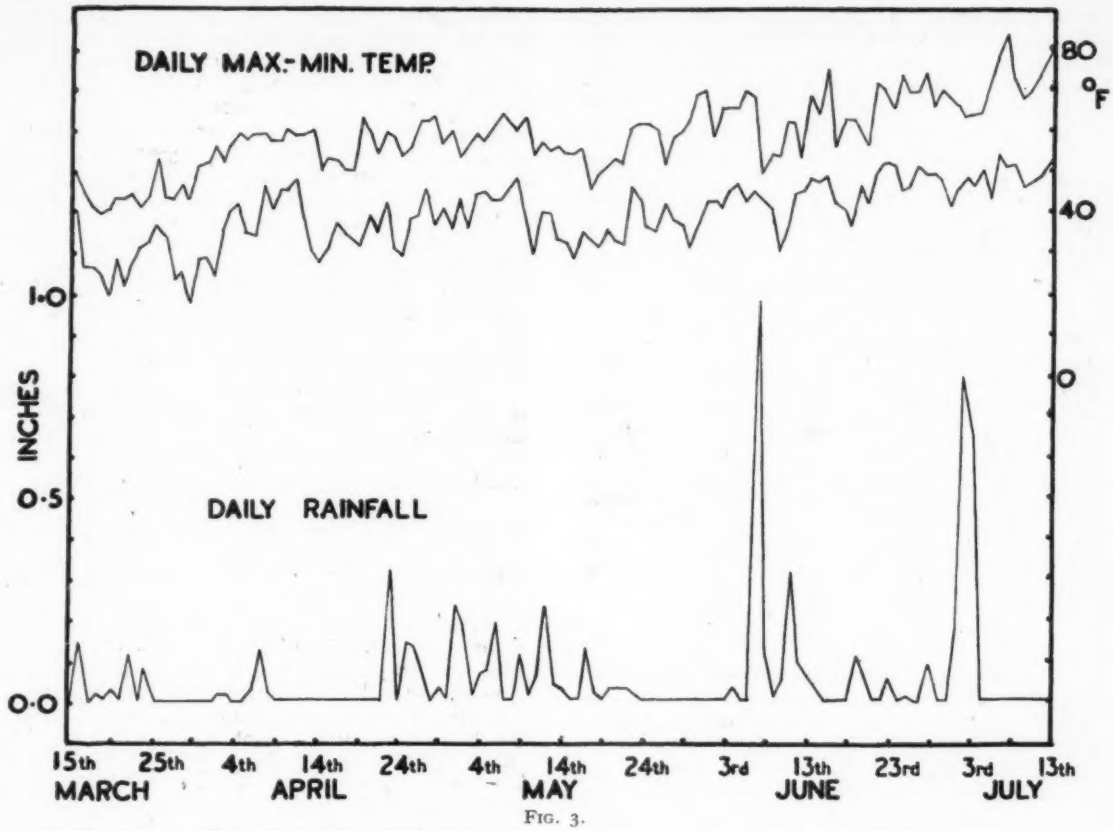

FIG. 3.

2. Evidence is recorded for the survival of *Nematodirus* species for at least 11 months on pasture in N.E. England. The results of pasture sampling for infective larvae are presented and their significance in relation to the control of the disease is discussed.

Acknowledgments.—One of us (R. J. T.) wishes to acknowledge financial support from the Agricultural Research Council and the Northern Counties Animal Diseases Research Fund in carrying out this work.

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Iodinated Casein Therapy for the "Non-sweating" Syndrome in Horses

BY

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"NON-SWEATING" is a condition in which the process of sweating is arrested in horses. Its occurrence is seasonal, chiefly in the hot weather in tropical countries. Imported breeds (T.B.) are more susceptible than the local breeds. The affected animal develops a dry and rough coat and on exercise fails to show visible sweating and the skin becomes hot. The animal is unable to do hard work and ultimately loses condition. A number of cases of "non-sweating" have been observed in hard-worked race-horses and Tonga ponies in Lahore. They developed this condition during the summer months and remained "non-sweaters" even during the winter months.

It was observed that the administration of a daily dose of 10 to 15 g. of iodinated casein* for a period of about four to eight days cured the affected animals, and treated animals again started to sweat. There are indications that the condition originates from some endocrine disturbance in animals whose heat-regulating mechanism is adversely affected as a result of over-work. Further work on the aetiology of "non-sweating" and the mechanism of action of the thyroid hormone is being continued.

* Protamone, containing 0.72 per cent. l-thyroxine on bio-assay.

Active Immunity Experiments in Very Young Calves*

BY

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WHERE consideration is being given to the diseases of young animals it is necessary to attempt to evaluate some of the physiological phenomena present during the first weeks of independent life.

The young colostrum-fed calf, as is well known, derives its globulin from the maternal colostrum which carries with it the normal and aquired immune bodies of the maternal serum. This is, however, foreign protein and it is gradually eliminated over the first two to three months of life.

In experiments with freeze-dried *T. foetus* antigen Kerr & Robertson (1954) found that intramuscular injections between the 3rd and 21st days of life produced no measurable immunological response, and that the first signs of such a response occurred after injections of antigen on about the 30th day. In other words, there is an unresponsive period in young calves immediately after birth, the duration of which probably varies with the nature of the antigen and during this time the passive antibodies of maternal origin exercise a protective action against certain types of infection. If the amount of antigen (*T. foetus*) injected during the first three weeks of life was very considerable the capacity to react with this same antigen at a later period was seriously impaired (Kerr & Robertson, 1956).

A group of experiments was designed to ascertain what relationship antigens of bacterial type more complex and active than that produced by the protozoan *T. foetus* had in the response of very young calves.

Six calves of seven days old were used, two other calves of four months of age were included as controls in order to test the potency of the respective antigens.

The antigens used were:—

(a) *Br. abortus* standard live vaccine (2,000 million per ml.).
(b) S.19 alcohol precipitated, washed in acetone, and dried in ether.
(c) *Salmonella dublin* heat-killed suspension (2,250 million bac. per ml.

Control Calves

K.8.—Four months old, sera negative 1:10 to *Br. abortus*.

Four injections of 0.1 gramme S.19 alcohol ppt. antigen were given at seven-day intervals. The first injection induced a good immunological response with a titre 1:1280. This titre was maintained during the remaining injections.

H.20.—Four months old. Sera *Salmonella dublin* negative.

Injection subcutaneously of 15 ml. heat-killed *S. dublin* antigen. Eight days later titre complete in 1:320 partial 1:640. Following second injection of antigen titre was maintained at 1:640.

Remarks:—These calves at four months old showed a marked immunological response to both antigens.

Brucella abortus Group

H.21.—After receiving colostrum this calf possessed a passive titre of 1:20 to *Br. abortus*. At seven days old the calf received 10 ml. of standard live S.19 vaccine. Repeated blood samples taken over three months failed to show presence of agglutinins at the lowest titre of 1:10. At the age of four months this calf received a second injection of 10 ml. live S.19 antigen, and nine days later the titre was 1:80 and at 21 days 1:640. The calf at nine months old was again blood negative and was boosted to a titre 1:1280 by a further subcutaneous injection of S.19 vaccine.

H.25.—A calf fed on colostrum but without a passive titre to *Br. abortus*. At the age of seven days it was injected with 10 ml. live S.19 vaccine. Subsequent sampling over a period of three months failed to show the presence of agglutinins. At four months old it received a second injection of live S.19 subcutaneously. Six days later the titre was 1:320 and at 14 days 1:1280.

H.23.—A colostrum-fed calf without a passive titre at three days old was given 0.1 gramme S.19 alcohol ppt., at 10 days old 0.2 gramme, at 15 days 0.5 gramme and at 35 days 1 gramme S.19 ppt. This calf reached a maximum titre of 1:40 at 42 days which fell to 1:10 at 85 days. At 113 days it was boosted with 0.5 gramme and rose to a titre of 1:640.

In this group of calves the use of live S.19 vaccine failed to produce a primary immune response. Subsequently on boosting at four months a satisfactory response was shown. Calf H.23 with regard to the fact that it had received a total of 1.8 grammes antigen over a period of 32 days showed a titre of 1:19 at 12 days and 1:40 at 42 days. This taking into consideration the nature and the quantity of the antigen was, however, a poor response. Again at four months an adequate response was given to the boosting injection. It is to be noted that this is the only calf in the whole experiment to show any primary agglutinin response.

Salmonella dublin Antigen Group

H.11.—A colostrum-fed calf without passive titre at seven days old received 10 ml. heat-killed suspension of *S. dublin*, 15 ml. at 14 days and 10 ml. at 21

* Contributed at the O.E.E.C. Seminar on "Causes and Prevention of Losses in Young Animals," held in Stockholm, February, 1956.

days. This animal failed to show any response until at four months of age when following the boosting dose of 15 ml. of antigen it gave a titre of 1:320.

H.28.—A colostrum-fed calf without a passive titre at seven days old received 15 ml. heat-killed *S. dublin* suspension followed by another 15 ml. at 14 days. No response to these injections took place. This calf on boosting showed an adequate response.

The final calf *H.27* in this series is the most interesting. This calf was fed colostrum. Its mother's sera tested against *abortus* was 1:320 and her colostrum 1:80. The calf's sera at three days old when the first injection was given was partial 1:320 complete in 1:160. It received 0.1 mg. *Br. abortus* S.19 alcohol ppt. antigen and 15 ml. *S. dublin* heat-killed antigen. Five days later the calf was re-injected with both antigens and at 28 days received again a further 0.1 gramme S.19 antigen. Despite the *abortus* antigen injected the passive titre to *abortus* fell steadily reaching 1:10 at 35 days. No measurable primary immune response was evident to *brucella* or *salmonella* antigen. At 87 days this calf was boosted with both antigens. The response in three days to *S. dublin* was a rise in titre to 1:320 and in eight days to 1:640. In the case of *Br. abortus* the titre rose to complete 1:320, therefore the agglutinins were again definite following the boosting injection.

It is interesting to note that in this calf with a high passive titre the *abortus* antigen did not apparently interfere with the elimination of that titre, moreover, there was no indication of circulating actively produced antibodies.

Discussion

In the previous work Kerr & Robertson had shown failure of the very young calf to show serological response to *trichomonas* antigen. The first unmistakable response occurred in one calf after an injection given when the calf was 30 days old. In this group of six very young calves using *abortus* and *salmonella* antigens five failed to show serological response, the remaining calf developed a low titre of 1:40 which quickly faded to a 1:10 titre which is considered a very poor response.

Also, Kerr & Robertson, 1954, found that the ability of calves heavily immunised with *trichomonas* antigen in the first three weeks of life to produce agglutinins, was considerably impaired when subjected at a later stage to further injections of the same antigen, but not their ability to react to other antigens. This phenomenon now suggested as immunological tolerance is complex and may be related to the nature and quantity of antigen used. In these experiments with high potency bacterial antigens this impairment was not observed.

An observation may be made with regard to the behaviour of these calves, although they were serologically negative at the time of the boosting injections at four months, they did, however, give an immediate response which was noted as early as three days. This may suggest that the early injections whilst not producing agglutinins did, however, create a tissue change so that the "recall response" took place.

A minor observation may also be made, that is in using live S.19 vaccine subcutaneously no primary response was evident particularly at 30 days which may suggest that the organism had not remained alive for any length of time in the tissues during that early period, but when at four months re-injection of live S.19 was made there was an effective immunological response.

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In Parliament

Rabbits

CAPTAIN DUNCAN (July 10th) asked the Secretary of State for Scotland if he will make a statement on the present situation regarding rabbit extermination in Scotland; and what new measures he has under consideration to prevent their increasing again.

MR. J. STUART: All areas of Scotland have been affected by myxomatosis. Nearly two-thirds of the total land area has been designated as rabbit clearance areas. It is too early to assess the results of the campaign so far. At the present, the survivors of myxomatosis are undoubtedly multiplying rapidly in some places. I am not considering any new measures, but it is clear that an intensified application of the present measures will be needed once the crops are harvested and natural cover dies back. Meantime efforts to eliminate rabbits should not be abated.

CAPTAIN DUNCAN: Has my right hon. Friend heard of the suggestion made by the farmers' representatives in Scotland that a myxomatosis bank should be kept by the Government and used to re-spread the disease is order to keep rabbits down? Even if that would mean introducing legislation, will my right hon. Friend consider it?

MR. STUART: I have indeed heard of the suggestion, but I must point out to my hon. and gallant Friend that the Advisory Committee on Myxomatosis has advised against it.

Bulls (Tuberculosis Testing)

CAPTAIN DUNCAN asked the Secretary of State for Scotland whether he re-tests all bulls each year for tuberculosis before they are lent to crofting townships which are 100 per cent. tubercular tested.

MR. J. STUART: Yes, Sir. All such bulls are tested before being sent out.

CAPTAIN DUNCAN: Is my right hon. Friend aware that in a 100 per cent. T.T. crofting county, when the test took place, last autumn, the only animal to go down in the test was the Government bull?

The Laboratory Mouse in Great Britain.—III. Intercurrent Infection (Ectromelia)

BY

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THE question of intercurrent infection among laboratory mice has been discussed in general terms, and more specifically in relation to infantile diarrhoea in an earlier paper in this series (Tuffery, 1956), and the present paper is concerned with intercurrent ectromelia infection in mouse colonies in this country.

Ectromelia is a member of the pox group of animal viruses, which are characterised by their comparatively large size and relative virulence, causing severe infections in a number of animals (including man), typically affecting the skin. Inclusion bodies are formed, particularly in infected epidermal cells, and animals which recover from an infection usually possess a high degree of immunity. Fenner (1947a) has proposed that, in order to conform to the practice applied to the other members of this group of viruses, the mouse disease should be called " Mouse-pox," and the term " ectromelia " should be reserved for the virus itself. However, in common practice the term mouse-pox is rarely used. Because ectromelia belongs to that group of viruses containing the important human pathogen smallpox, it has been studied in some detail in the hope that it might serve as a " model " for this infection. It is a natural parasite of the most convenient laboratory mammal of all, and offers opportunities for epidemiological studies not readily available for other types of infection. As a result, work using this virus has all been directed to the study of phenomena arising when one deliberately infects these animals, either singly or in large numbers, but there have been no investigations aimed directly at the removal of infection from a mouse population such as a laboratory breeding stock. In other words, there are no scientific methods for the control of this disease yet, but one can work backwards and deduce a number of recommendations from the results of experiments upon deliberately infected populations.

General

The disease has been described by a number of workers, particularly Fenner (1948a, b) and will not be re-described here. Shope (1954) gives a good brief description, and Marchal's (1930) original paper and one by McGaughey & Whitehead (1933), contain detailed accounts of the clinical symptoms. For the animal technicians in charge of the colony from day to day some notes by Parish (1950) are to be strongly recommended; Dingle (1941) also gives a good description. From observations made during the course of this survey, it is clear that certain points need emphasis. The disease would appear to be most frequently recognised at the stage when the tail or feet show signs of swelling, and skin lesions, covered by exudate, occur. The animal is most infectious when these skin lesions have formed, so that culling, to be of any value, must be done at the very first sign of skin lesions, and the whole box needs to be culled at once. Cages must then be adequately sterilised. Animals dying from the acute type of disease are almost non-infectious, but are probably rarely recognised as being victims of ectromelia. In fact, it is impossible to say whether deaths from acute ectromelia occur in significant numbers in British mouse colonies.

This disease is apparently not very widespread in the U.S.A., and the majority of American mouse breeders and users appear to be unfamiliar with it. Some concern is now being felt, however, and a committee has been set up by the Virus and Rickettsial Study Section of the Division of Research Grants, National Institutes of Health, to study the possible dangers of spread of this virus. This committee found that, of 475 mouse colonies in America, ectromelia was proved to occur in four, and might possibly exist in another 18 (Shope, 1954). Fenner (1949) remarks upon the apparent absence of this infection in the U.S.A., and Dingle's (1941) description is not from personal experience. Strong (1950) makes no mention of it. Ratcliffe (1945-6) in reference to American mice states that its " . . . incidence [is] unknown, probably widespread, but usually inapparent," but this appears to be a remark based on the publications of such workers as Fenner, rather than upon actual observations. Dalldorf & Gifford (1955) working in America, describe the identifications of two agents sent to them from Europe as neurotropic viruses as ectromelia, and they expressed concern at the risk of introducing the infection to American colonies in such a manner. The only accounts of outbreaks in America have been published by Trentin (1953), Trentin & Briody (1953) and Gaylord & Melnick (1953). Fenner (1949) has very ably reviewed our knowledge of ectromelia up to 1949, since when it has become obvious that this virus infection is an ideal model for certain types of work. De Burgh (1950) and Nossal & de Burgh (1953, 1954) found it very useful for the study of virus multiplication in animal tissue and the cytochemical changes involved during infection. It is not the purpose here to give another full review, but it may prove useful to discuss very briefly our knowledge of ectromelia virus and mouse-pox so far as it may affect laboratory mice in general. For this purpose, one must draw heavily on Fenner's series of papers.

The Natural Disease

It was obvious during the course of this survey that the aetiology, pathology and epidemiology of ectromelia were not fully appreciated by those in direct charge of mouse colonies. The value of the various control and prevention measures which are—or should be—applied to the well-run mouse colony can only be fully appreciated (and therefore properly carried out) if there is some understanding of the basic methods of the spread of a disease, and of sources and reservoirs of infection. Where the research worker himself is aware of these factors, his knowledge and advice (and even interest!) does not always seem to be passed on in a practical manner to the man who actually breeds and cares for his animals.

Ectromelia is spread by contact between infected and uninfected animals, and between uninfected animals and a contaminated environment. An infected mouse is infectious for its mates when it has open skin lesions, *i.e.* for a period between the seventh and 21st days after infection. During this period very large quantities of virus are released into the surroundings (Fenner, 1947b), and bedding and cages become heavily contaminated and remain infected for three to four days. Animal technicians who have handled mice with open lesions are presumably capable of infecting mice from clean cages. It seems most likely that the virus enters the animal by way of minute skin abrasions. It has a very great predilection for dermal tissues, and once it has entered a small cut it soon multiplies and sets up a small primary lesion, which is first visible at about the seventh day after infection. During this period virus is released from necrosed dermal cells and enters the bloodstream via the lymphatics setting up a transitory viraemia. The virus is almost immediately taken up by cells of the reticulo-endothelial system, when it begins to multiply in the liver and spleen. Eventually, sufficient cells in the liver and spleen are necrosed to cause release of virus into the bloodstream, when a heavy viraemia is set up lasting from the fourth to the 13th day. The secondary viraemia transports the virus to the skin tissues, which are very quickly invaded, cells are killed, and by the 10th day (if the animal has not already died) signs of the secondary rash are evident—at this stage the animal is infectious. In acute cases virus multiplication reaches such a high level that very large portions of the liver and spleen are necrosed and the animal dies before the secondary skin lesions have had time to develop; thus it follows that animals dying from the acute disease are of little danger for the spread of virus. Apart from open skin lesions there are other possible sources of virus, and possible routes of entry other than skin abrasions; but Fenner's work suggests that most of these are relatively unimportant. Infection via the oral route was possible only if very high doses were used, and the respiratory route seems unimportant because the pneumonia resulting from experimental infection by this route is rarely seen in naturally infected animals. Infection via the conjunctiva may well be of some importance, especially if there is cannibalism which results in the eating of infected viscera. One cannot readily test the possibility that sexual intercourse or intra-uterine infection are major routes of infection but it seems unlikely. In conclusion, the chief source of virus in a mouse colony will be the undetected skin lesion—or the mouse with a skin lesion but which has not been culled. Control measures within the mouse colony now become fairly obvious—vigorous culling of any sick mouse, especially if it shows signs of exudative skin lesions, coupled with at least a daily examination of every mouse box. But even this will be useless if, as soon as one technician has removed a mouse (or rather, the whole box of mice) with his hands, he promptly lifts up with the same (contaminated) hand mice in the next box to see whether they are infected. If one suspects that ectromelia has gained entrance to a colony one should handle individual mice as little as possible; and when this must be done, broad forceps should be used at the back of the neck. This method was in use at colony No. 6, and appeared to function very well. Normal hygiene measures still hold good. Reduce the traffic of mice between boxes to a minimum. Sterilise emptied boxes *before* bedding, etc., is removed. Avoid overcrowding, cull the entire box if one member appears to be suffering from ectromelia. " Prevention is better than cure " is the prime rule for ectromelia control. There is no reason at all why ordinary hygiene measures should not be sufficient, and if infection should gain access, vigorous culling ought to hold it in check.

The Disease in British Mouse Colonies

However, the ectromelia situation in British mouse colonies is probably not one where sudden severe outbreaks due to newly introduced infection is characteristic. Sudden vicious outbreaks do occur, but one wonders whether, in most instances, it is not a sudden flaring up of a more or less permanent endemic infection. Fenner's work on ectromelia was done mostly with two strains of the virus—a very virulent " Moscow " strain with a high infectivity, and a somewhat less virulent " Hampstead " strain of lower infectivity.

The " Moscow " strain gave rise to an appreciable number of deaths from the acute type of infection with no sign of primary or secondary skin lesions, and in one epidemic only 17 per cent. of the exposed mice escaped infection. The " Hampstead " strain, on the other hand, gave rise to no deaths of the acute type, but unlike the " Moscow " strain gave rise to a number of inapparent cases. In one epidemic 70 per cent. of the mice escaped infection (Fenner, 1948a). Most cases of ectromelia in mouse colonies which were found in the course of this survey are explicable if one considers that the infected colonies possess a strain of low virulence—probably lower than the " Hampstead " strain. Such low virulence strains might also have a low infectivity, and it seems reasonable to suppose that these strains can spread slowly in an endemic fashion throughout the colony and yet not be noticed by those caring for the mice. It must be admitted that the general conditions within the affected colonies (either at present or in the past) were conducive to the existence of such an infection.

Webster (1946) considered that there were two main types of epidemics: Type I, which occurs in susceptible populations exposed for the first time to a virulent parasite; and Type II, which occurs in a population where the parasite is already established. An example of the first type in human communities might be an outbreak of typhoid in England due to a contaminated milk supply. Poliomyelitis in this country affords a good example of the second type of epidemic. Ectromelia in mouse colonies might well give rise to both types, but on the basis of the information collected in this survey, it is impossible to cite particular outbreaks as examples of one type or the other, though in all probability both types have occurred.

Colony No. 10 had, in the past, experienced three epidemics, at three-year intervals, but appeared to be quite free from this infection in 1955. It may be (for one cannot prove such a point) that these epidemics were of Webster's Type I—each time, the infection gained entrance by some means or other, and the non-immune mouse population (the colony being re-started after each outbreak) was very rapidly killed off. Obviously, if such is the explanation of these epidemics, there is a fault in the colony management system which allows infection to get in from time to time. A badly-fitting door is all that is needed, though the fault is probably less obvious than this. Webster's Type II epidemic, however, would seem to be the more frequent, at least in this country. The findings of this survey fit this type better.

Fenner's work on this virus is very thorough, but there are still large gaps in our knowledge. Experimental demonstrations of the existence of strains of low virulence and low infectivity and studies of these strains are very few, and it is certainly not known whether, in fact, epidemic ectromelia in British mouse stocks is generally due to low or high virulence strains. The picture which emerges is that there has been " . . . a bad outbreak in the past, when we culled the entire stock and began again." More frequently, " X seems to be supplying mice which occasionally show skin lesions," or, " we occasionally see a mouse with a scab." The last type of comment was characteristic and might well apply to epidemics of Type II. If these relatively avirulent strains of ectromelia exist they can all too easily persist in the average British mouse colony. Epidemics (in the sense of sudden increase in incidence or mortality) may be precipitated in such infected populations by a variety of means, many of which can apply to a mouse breeding colony. The addition of non-immune recruits, for example, can start a flare-up. Topley (1942) gives greater details. If susceptible recruits are added in small numbers over a period (*i.e.* the birth of young in a breeding colony, or the buying in of batches in a user colony) at least two possibilities arise. Either an endemic situation is perpetuated (if the average risk of infection to the newcomers is high), in which there are only sporadic cases and no major outbreaks; or, if the average risk of infection is low, the proportion of susceptibles may build up until a chance succession of infections sparks off a new wave. Both these possibilities would seem applicable to the current problem.

If the virus strain was of low virulence, there should be few deaths from the acute type of disease. This seems likely to be the case, though the infrequency of *post-morten* examinations makes one unwilling to assert this too strongly. Further, if it is of low virulence, there will be a proportion of subclinical infections which would account for the persistence of the unsuspected infection. How high this proportion can be, and whether such mice can infect cage mates, are questions yet to be answered. There is another point with reference to " hidden " infection which might be mentioned at this stage, and which is generally applicable to a wide range of infections beside ectromelia. True subclinical cases will show no signs of infection unless resort is made to such procedures as testing blood for the presence of antibodies, etc., but it seems likely that the general run of examinations given to mouse stocks are insufficiently thorough, and a number of detectable cases will be missed and will therefore react from the epidemiological point of view as if they were true subclinical cases capable of spreading infection. This may also help to account for the endemic nature of ectromelia. But it is not even necessary to add recruits to a population to turn an endemic into an epidemic infection. For example, the bringing together of mice into large groups will suffice, and this may help to explain the discovery of ectromelia in the user colonies. One can, of course, put a large number of mice into one cage (a common practice upon receipt of a new consignment among user colonies), but one can achieve the same result by other means. Fundamentally, the effect is to increase the contact rate between animals, and this will be done if the conditions in the receiving colony are of low enough standard—too little care being taken over cage cleaning for example—and infective particles are distributed among the population.

Most of the outbreaks described by the various colonies (see Table II, Tuffery, 1955a) were of not very great importance at the time. In the past there had been one or two disastrous epidemics resulting in the destruction of the entire stock either by the disease itself or deliberately on the part of the technicians in an attempt to cut their losses and begin again. As already mentioned, it was quite impossible to tell whether a virulent or relatively avirulent strain of the virus was responsible. If there were a high proportion of acute deaths, the probability is that a virulent strain was present, but whether this high proportion ever existed is unknown, because of lack of autopsy records. An epidemic among laboratory mice will never be quite comparable with the experimental epidemics of Topley and Webster, because in the latter events were allowed to run their full course—the animals became infected and were allowed either to die or to recover. Animals in the laboratory colony will never progress beyond the overt infection stage—as soon as skin lesions in ectromelia are seen, the animals will be culled. Thus the " loss " rate in a colony epidemic may be very

high, but the true " death " rate may be very low. Again, one cannot tell whether these epidemics are due to high or low virulence strains. The net result is the same of course—a loss to the laboratory. In terms of cash this may represent a considerable sum; but in terms of interrupted experimental work the loss might be irreparable.

Little has been said with regard to the vitiation of experimental work by outbreaks of ectromelia. During the course of this survey, it was obvious that many mouse users considered that ectromelia could exist in a latent form in animals, and be stimulated into overt infection under conditions of experimental stress.

Fenner quotes several instances where this appears to have happened, but expresses the opinion that all these cases can be explained if one asumes that, rather than lighting up the latent infection, an incubating or subclinical case was included in the experimental series. On epidemiological grounds, and on the results of actual experiments, the long-term carrier does not exist (or only exists in a very small proportion of cases) in this disease. One cannot, therefore, stimulate into overt infection a dormant latent infection such as can be done with Thieler's encephalomyelitis. Thus, in cases where ectromelia appears to vitiate experimental results, one might look to the colony supplying the mice for the cure (assuming that infection was not picked up in the experimental room itself). Ectromelia-free colonies with no endemic infection are the answer.

Discussion

As a result of the investigations by Fenner and other workers, ectromelia is a comparatively well-characterised virus, certain properties of which are beginning to be understood. Its relationship to other members of the pox group of viruses is well established on immunological and morphological grounds, and the pathology of the disease it causes in its natural host is reasonably well-known—at least in respect of the more virulent strains in existence. We also know a little about certain of its epidemiological properties as the result of work by Topley and his associates, and by Fenner. But all this really adds up to a very small part of what there is to learn, and there is almost nothing known about the virus in relation to the aspect we are interested in here—that is, control of the natural disease. Any control measures we may recommend are based upon information which was gained with a quite different end in view. But for all that, the situation in British mouse colonies could be improved considerably if mouse users and animal technicians appreciated the value of adequate hygienic measures—really vigorous culling coupled with daily inspection of all animals—and the fact that preventive measures are by far the surest.

Summary

Ectromelia (Mouse-pox) is an important disease of British laboratory mice, causing real concern to at least eight of the largest mouse-breeding and using establishments. Endemic rather than epidemic infection is probably of greater importance, but an adequate explanation of its endemic status, and of the occasional epidemic outbreaks, has yet to be found. Entirely satisfactory control measures are not yet available but there is no doubt that a general improvement in standards of hygiene would do much to improve the situation.

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TRACTORS DISPLACING HORSES

The number of tractors at work on the world's farmlands is increasing by nearly 500,000 per year, the Food and Agriculture Organisation states.

The greatest proportional increase was in the least-mechanised region—the Far East—where the number in use is reported to have increased to 20,000 from 13,000, or by 55 per cent., in the three-year period from 1952 to 1954. Then came Europe with an approximate increase of 31 per cent., and Latin America with 20 per cent.

This increasing use of machinery on the farms is accompanied by falling world (excluding U.S.S.R.) horse and mule populations. Before the Second World War there were 74.7 million horses in the world; by 1953-54 their numbers had dropped to 59.1 million. Over the same period the mule population dropped to 15.6 million from 18.4 million. But camels, used as pack and draft animals are more than holding their own in Asia and Africa. The camel population of those two areas rose from 7.8 million before the war to 9.7 million in 1953-54, an increase of 24 per cent.

Third International Congress on Animal Reproduction, Cambridge June 25th to 30th, 1956

IN our last issue we referred to the luncheon given by the President of the Royal College of Veterinary Surgeons, Professor Pugh, to the Organising Committee. On Monday evening, members of the Congress were received by the Vice-Chancellor of the University in the University Combination Room of the Old Schools, and this provided an ideal venue for the renewing of old acquaintances and the making of new ones.

On Tuesday morning, at 9.30, the Congress was formally opened in the Art School by The Earl St. Aldwyn, T.D., Parliamentary Secretary (Lords), the Chair at the Opening Meeting being taken by Sir Thomas Dalling (President) who was supported by the President of the Permanent International Committee (Professor Nils Lagerlöf), the Chairman of the Organising Committee (Mr. G. N. Gould), the Vice-Chairman (Dr. John Hammond), the Honorary Secretary and Treasurer (Dr. Joseph Edwards) and the Chairman of the Programme Committee (Dr. A. W. Stableforth). Unfortunately the Chairman of the Hospitality Committee (Professor L. P. Pugh) was unable to be present. The Opening Meeting was also addressed by Professor Lagerlöf, Sir Thomas Dalling and Mr. Gould.

At 10 o'clock the Congress got to its real business with the first of the Plenary sessions, which was on "The Physiology of Pre-Natal Life," papers being given by Professor L. E. Casida (U.S.A.), Professor A. Jost (France), and Professor E. C. Amoroso (Great Britain). Speakers dealt with nutritional and other factors affecting the development of the embryo from its very early stages up to the time of birth. Other Plenary sessions were taken on Tuesday evening and on Wednesday, Thursday, and Friday mornings, sectional meetings being held later each day.

At the Tuesday evening session, papers were presented by Dr. G. V. Parshutin on "The Rôle of the Nervous System in the Reproduction of Livestock," by Professor J. O. Almquist and Dr. E. B. Hale on "An Approach to the Measurement of Sexual Behaviour and Semen Production of Dairy Bulls," by Dr. A. Kvasnitski on "Generative Function of Ovary and Productivity of Farm Animals," and by Professor M. P. Kuznetsov on "Artificial Insemination of Sheep in the U.S.S.R."

The Plenary meeting on Wednesday morning was devoted to genital infections, the main addresses being given by Dr. J. Terpstra (Holland), Dr. N. O. Rasbeck (Denmark), and Mr. J. R. Lawson (Great Britain). These speakers all devoted a good deal of their time to *Vibrio fetus* infection, which is concerning veterinary surgeons in all the countries concerned. Dr. Terpstra included in his address a description of a third type of Vibrio in addition to *Vibrio fetus* and the Vibrio now regarded as saprophytic. He also dealt with some preliminary experiments on the possibility of Strain 19 vaccination via the vagina. Professor Rasbeck dealt mainly with control schemes for vibriosis in Denmark. Mr. Lawson dealt with various aspects of vibriosis and brucellosis, to the finding of fungi in 7 per cent. of foetuses and to trichomoniasis. It was notable that whilst trichomoniasis is no longer a problem in any of the countries represented by the main speakers, it is still a problem in a number of countries where artificial insemination is not widely available. Other speakers at this meeting included Professor Lagerlöf, who stressed the importance of eradication of *Vibrio fetus* from breeding herds; Mr. Millar (Great Britain) who referred to a virus which appeared to be associated with infertility; and Mr. Stewart (Great Britain), and Dr. Adler (Denmark) who both dealt with the treatment of bulls.

Plenary sessions on Thursday morning were devoted to "The Effect of Very Low Temperatures (Deep Freeze) on Cells and Tissues" and "Recent Advances in A.I. Techniques and the Study of Animal Behaviour." The first session was taken up with addresses by Dr. A. S. Parkes (Great Britain), who dealt with the earlier work and general development of deep freeze on cells and tissues, and Mr. L. E. Rowson (Great Britain) who dealt with its application to spermatozoa and to artificial insemination. These two very excellent addresses took up almost the whole of the time allocated and there was very little time left for discussion. At the second session, the meeting was addressed by Professor N. L. Vandemark (U.S.A.), Professor C. Thibault (France), and Professor T. Bonadonna (Italy), the former speakers dealing with various aspects of the application and development of techniques for artificial insemination, the latter mainly with bull behaviour and factors affecting it.

The last Plenary session was on Friday morning and was devoted to "Nutrition in Relation to Reproduction," papers being given respectively by Dr. A. Hansson (Sweden), who gave a most interesting address dealing in the main with nutritional levels, and Mr. S. L. Hignett (Great Britain), who described a series of fundamental experiments on the effect of absolute and relative amounts of calcium, phosphorus, and manganese and their association with nutritional levels in a series of 150 heifers in which the food intake had been related very exactly to reproduce efficiency and sexual behaviour.

It is not possible to list here papers at the sectional meetings, but the following titles or subjects will give some idea of the scope of these papers of which we hope to give some details in our Abstract columns at a later date.

Physiology Section

The Relation of Maternal Nutrition to Neonatal Mortality in Merino Lambs, Relation of Fecundity in Milking Cows, and the Calcium and Phosphorus Content of the Hair, Nutritional and Hormonal Influences upon Testis Function, Male and Female

Sperm Antagglutinins, Physical Investigations on the Movements of Bull Sperm Cells, Effect of Different Planes of Nutrition on the Composition of Bull Semen, Aerobic Metabolism of Spermatozoa, Aerobic Fructolysis of Semen, Sperm Characteristics of Identical and Non-Identical Bull Twins, Chromosomes in Andrological Diagnosis, Spermatogenesis and Spermatic Reserves in Bull and Ram, Influence of Sodium and Potassium Ions upon the Motility of Sperm Cells, Biochemical Relationships between the Early Rabbit Embryo and its Environment, Factors affecting the Maturation of the Egg in the Rabbit and Sheep, Experimental Superfoetation in the Rabbit, Testicular Hyaluronidase for Fertilisation in Mammals, Oestral Behaviour and Fertility in Cattle, the Thyroid Gland of Cattle, Blood Groups in Cattle, Plant Oestrogens and Animal Reproduction, Testicular Thermo-Regulation, Gonadotrophins in the Serum of Pregnant Mares, Maternal Influences on Litter Size in Pigs.

Pathology Section

A series of papers on Genital Vibriosis and its Diagnosis and Control, the Diagnosis, Therapy, and Control of Trichomoniasis, Ovine Brucellosis in New Zealand, Vaginal Prolapse in the Ewe, the Reproductive History of 473 Cattle maintained indoors for seven years, Infertility in Cattle associated with Abnormalities of the Fallopian Tubes, the Incidence of Salpingitis and Bursitis, Cystic Ovaries and Delayed Ovulation in Bovines, Effect of Enucleation of Corpus Luteum, Nymphomania, the White Blood Picture and Bone Marrow Changes in relation to Retained Foetal Membranes, Fertility of Cows after Caesarean Section, Testicular Hypoplasia, Pathological Changes in the Testicles of Bulls, a New Type of Genital Mal-formation in Cattle, and four papers dealing with Endometritis, Abortion, Still-Birth, and Disease in Equines.

Artificial Insemination Section

Papers on Egg Transfer in the Rabbit and Sheep, Artificial Insemination in Sheep and Goats, a series of eight papers on the Use of Frozen Semen in Cattle, the Use of Electro-Ejaculation, the Nigrosin-Eosin Method of Staining Spermatozoa, Progeny Testing of Bulls in A.I., Testing for Lethals, Type, and Production at A.I. Centres, Age-fertility Relationships, Artificial Insemination in Pigs, Dilutors for Semen, the Health of Bulls used for Artificial Insemination, Sexual Behaviour of Bulls, Feeding of Bulls, a series of papers concerned with Breeding in Equines, a Plastic Artificial Vagina, Individual Inseminators Conception Rates, and Canine A.I.

During the Congress, members were able to visit a most excellently staged and comprehensive series of demonstrations in the Zoology School close to the main meetings.

On Thursday afternoon, visits were paid to the Animal Research Unit at Huntingdon Road, Cambridge, and to the Veterinary School, in both of which places members had the opportunity of seeing the accommodation and a series of demonstrations of the work in progress.

A series of films was shown dealing with artificial insemination in pigs and aspects of bull behaviour.

The Arts School with its three Lecture Theatres in close proximity and Central Room, which was adapted as a lounge where members could meet, formed an ideal centre for a Congress. The success of the meeting was also aided by the provision of simultaneous translation in each room and the running of sectional meetings to a fixed time-table so that members wishing to move from section to section could do so with the assurance that any paper they wanted to hear would be taken at a given time and that they would be able to understand it.

The lighter side of the Congress was provided by the opening reception on Monday night (already referred to), by a Garden Party very kindly given by the University at Trinity College, and a concluding soirée, again in the University Combination Room, on Friday evening.

A large number of ladies participated in the programme provided by the Ladies' Entertainments Committee, presided over by Mrs. Beveridge, and which included visits to the Colleges and other places of interest in Cambridge, including especially certain aspects of child education. Professor and Mrs. Beveridge also entertained members to a graceful and characteristically British function in their own garden on Wednesday evening.

On Saturday, full-day excursions were arranged to Newmarket, several beautiful villages in Suffolk, as well as to Flatford Mill, the birthplace of John Constable, and now the headquarters of the Society for the Promotion of Field Studies, many members going on afterwards to the Royal Show at Newcastle.

It is understood that the Congress has been invited to hold its fourth meeting in the Netherlands, probably in 1960.

REJECTS FROM ATTESTED HERDS

Marking of rejects from attested herds was discussed at the meeting of the executive committee of the Federation of Wholesale Meat Traders. The Federation had pointed out to the Ministry of Agriculture the unfairness of reactors being left unmarked.

The Ministry replied that marking would penalise the farmer who was trying to free his herds from disease, and that consequently, it was not considered desirable or practicable in present circumstances to mark cattle which reacted to the tuberculin test.

It was decided to send copies of the correspondence to the N.F.U., pointing out that it is the opinion of the Federation that the farmer should be compensated for beasts which responded to the tuberculin test and asking if they would be prepared to support the Federation in an attempt to get the same conditions applied to cattle rejected from attested herds whether they were in a clean area or otherwise.

In Brief

Recent Developments in Artificial Insemination

MUCH of the recent research work in Western Europe and in America has been devoted to a comparative study of various diluents for semen and on factors influencing the survival rate following deep freezing. The main diluents on which work has been progressing are milk—whole, homogenised, or skimmed—and glycine, and these have been compared mainly on the basis of conception rates, with the more widely used phosphate and citrate bufters and with and without various antibiotics. In general, apart from glycine, no great advantage except from economic cost has been demonstrated. In the case of glycine much less work has been carried out, but there is evidence of a considerably increased survival period. Reports on the relationship to fertility are, however, at variance and further work on a larger scale will be needed to clarify the position.

Some of the most interesting and controversial research has recently appeared in the Russian literature. One aspect of this work concerns heterospermic insemination, where it is claimed that fertility is greatly increased and that vigour and growth rate of the offspring are significantly higher than the controls. The substance of the claim is that supernumerary sperm penetrate the ovum bearing within themselves the basis of certain physiological reactions although they themselves take no part in fertilisation. In the case of heterospermic inseminations, therefore, there is a greater diversity of these physiological processes than would occur with normal polyspermy and the offspring, therefore, benefit.

In the case of sows, selective fertilisation was found to take place with emphasis on the outcross. In mixed litters it was also claimed that the pure offspring derived benefit from the same maternal environment as the hybrid with its greater vigour, and consequently was a better and more vigorous animal than the young from a pure-bred litter only. It is argued that the factors responsible for hybrid vigour in the cross-bred litter-mates influenced the pure-breds while *in utero*.

In one experiment on heterospermic insemination in cattle four breeds of bulls were used and the inseminations carried out both singly and with all combinations of semen. Fertility rates were lowest with single breeds (67 per cent.), higher with crosses (76 per cent.), higher still when the semen of two breeds was mixed (84 per cent.), and when three or four breeds were mixed (86 per cent.).

In work on ovum transplantation the Russians also claim that evidence of the influence of the host mother was shown in the offspring, and that characters of the true genetic parents had been modified. In experimental ovum transfers in this country no such modification of characters has been observed.

The claims regarding increased fertility and vigour in heterospermic inseminations are of considerable interest, and although on paper it would appear that they are an attempt to justify Lysenkoism, it would be a mistake to dismiss them merely on these grounds, and attempts either to confirm or disprove the claims are certainly warranted.

L. E. A. ROWSON (March, 1955).

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Sperm Cell Preservation

PAPERS PRESENTED AT THE U.S.A. FROZEN SEMEN CONFERENCE OF THE NATIONAL ASSOCIATION OF ARTIFICIAL BREEDERS, SEPTEMBER 29TH, 1954.

Conception Rates Obtained Through the Use of Frozen Semen in Routine Field Trials. J. W. Snyder.

How Much can Frozen Semen Increase the Usefulness of Dairy Sires? R. W. Bratton.
Diluter Composition, Processing and Storage of Frozen Semen. John P. Mixner.
Effect of Differences in Breeds, Bulls' Ejaculate and Season; Some Equipment and Field Techniques for Frozen Semen. H. H. Brugman.
A Study of Variation in Motility Estimations from Ampoules of Frozen Semen. H. O. Dunn.
Techniques for Freezing Bull Spermatozoa in Milk Diluter and Preliminary Breeding Results. John O. Almquist.
Conception Results with Frozen Semen. E. F. Graham.
A Preliminary Report of Effect of Glycerol Equilibration Time on Fertility of Frozen Semen. J. A. Williams.
Current Results with Frozen Semen. F. I. ELLIOTT.

POLGE, C., & ROWSON, L. E. A. (1952). Fertilizing Capacity of Bull Spermatozoa After Freezing at −79° C. *Nature.* **169.** 626.

———, SMITH, A. U., & PARKES, A. S. (1949). Revival of Spermatozoa after Vitrification and Dehydration at Low Temperatures. *Ibid.* **164.** 666.

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Current Literature

ABSTRACTS

An Experiment on the Cumulative Efficacy of Phenothiazine Salt Mixture Against Nematodirus and Haemonchus in Lambs During a Second Grazing Season. COLGLAZIER, M. L., and TURNER, J. H. (1955). *Amer. J. Vet. Res.* **16.** 558-62.

The writers previously reported the results of two similar experiments, which showed that a 1:9 phenothiazine-salt mixture, administered free-choice, gave a considerable measure of control of mixed infections of *Nematodirus spathiger* and *Haemonchus contortus* acquired by lambs grazed on heavily contaminated pasture. The medicated and unmedicated lambs in both previous experiments, carried out in successive years, were grazed on separate pastures of as nearly equal larval contamination at the start of each of the two experiments as it was possible to arrange. Thus, the second experiment was a duplication of the first. These results gave no information on the cumulative advantage of this regimen of medication such as might accrue when lambs are continued on the same pasture over a second, successive grazing season.

Such an experiment was therefore performed with groups of lambs similar to those previously employed, except that the medicated lambs (a) were grazed on the same contaminated pasture used by the medicated lambs the previous year, and the unmedicated lambs (b) grazed the same contaminated pasture used by the unmedicated lambs the year before. A third comparable group (c) was grazed at the same time on a relatively clean pasture. As the previously reported experiments were referred to as "first and second trials," the experiment now reported was referred to as the "third trial."

The average daily consumption of phenothiazine per lamb was 0.226 g., or 2.26 g. of the mixture. Each of the lambs of group (b) and of group (c) consumed, on the average, 4.46 and 4.60 g., respectively, of plain salt per day. The daily consumption of the medicated mixture was higher during the first and second trials, 5.04 and 2.82 g., respectively, than in the third trial.

Once substantial infections were established in the lambs grazing the contaminated pastures, the lambs on the phenothiazine and salt mixture had lower faecal egg counts of *N. spathiger* and *H. contortus* throughout most of the experimental period than the comparable lambs on salt only. This was particularly noticeable during the latter weeks of the experiment.

Two unmedicated lambs on pasture B died during the twelth week and another died while being shorn at the termination of the experiment. There were no deaths among the medicated lambs on pasture A, or among unmedicated lambs on clean pasture C.

The results confirm those obtained in previous trials.

The cumulative efficacy of phenothiazine-salt mixture against *Nematodirus* and *Haemonchus* is shown by improvement of control in the third trial over the second trial in respect to worm burdens, egg counts and lamb weights. Therefore, any advantage that may have accrued initially to the medicated lambs in this trial is presumed to have been due to the pasture. This, presumably, resulted from the fact that lambs grazing this pasture the previous season had access to phenothiazine and salt.

The continued use of free-choice medication with phenothiazine and salt during successive grazing seasons has been shown to be advantageous in controlling combined natural *Haemonchus* and *Nematodirus* infections in lambs. Medicated lambs, as compared to nonmedicated controls, showed lower egg counts, fewer total worms, greater gains, better condition, and higher blood levels during the two trials. The lambs benefited more from the medication than comparable lambs of the previous season, indicating that the regimen achieves progressive decontamination of pastures in successive seasons.

J. S. S.

Studies on Encephalomalacia in the Chick (4). SINGSEN, E. R., *et. al.* (1955). *Poult. Sci.* **34.** 1075-9.

The authors point out that although it has previously been shown that encephalomalacia ("crazy chick disease") of chicks can be produced experimentally by feeding cod liver oil to vitamin E deficient chicks, no tests have been made to compare the encephalomalacia-producing properties of oils from different species of fish.

When oils from four species of fish were tested in this way it was found that their encephalomalacia-producing properties were correlated with their degree of unsaturation, as measured by their iodine numbers. The addition of 0.5 to 1.0 per cent. of a highly unsaturated fish oil to a diet low in vitamin E was sufficient to produce encephalomalacia in chicks hatched from vitamin E deficient hens. The oil that is present in fish meal appeared to be as effective as the extracted oil. The incidence of the disease tended to be higher when the food was stored at higher temperatures. The animal fat in a sample of meat and bone meal did not tend to cause encephalomalacia.

E. A. G.

News and Comment

FIFTY YEARS OF MEAT INSPECTION

We note from an American contemporary that the profession in the United States is celebrating the "golden anniversary" of Federal meat inspection by veterinary surgeons. It was on June 30th, 1906, that Congress passed the necessary legislation and decided that the trained professional man alone was competent to take charge of this all-imporant sector of public health. "The public," our contemporary writes, "owes to the man who wears the eagle-mounted badge of the veterinary meat inspector an incalculable debt of gratitude; his application of professional training and experience has touched the life of every citizen."

In the meantime we can but wait to see whether it will take a further 50 years for public opinion in this country to catch up with accepted practice not only in the United States, but in most Western countries also.

THE U.S. ARMY VETERINARY CORPS

Readers will have noted in the press a few weeks ago a statement by the United States Secretary of Defence, Mr. Charles E. Wilson, to the effect that he proposed to disband the Army Veterinary Corps. Very naturally our American colleagues are shocked at such a suggestion, and the American Veterinary Medical Association intends to mobilise public opinion in defence of the Corps.

Veterinarians have been employed by the U.S. army as food inspectors since the disastrous outbreaks of food poisoning in the Spanish-American war of 1901. During more than 50 years since, there have been no outbreaks of comparable severity.

Last year the Army Veterinary Corps inspected more than 22,000,000,000 lb. of food, much of it served to United States servicemen overseas. In addition to this huge task the Corps is concerned with developing methods of protecting and decontaminating foods exposed to possible chemical warfare; pursuing research into combating the danger from animals intentionally infected with agents harmful to man; and studying the effects of atomic radiation on food-producing animals.

It is to be hoped that these evidences of the importance of our colleagues' work will persuade those responsible for the decision to disband the Corps, to change their minds.

SHEEP WORRYING

Sheep worrying by dogs continues to be a serious problem to farmers. During 1953, 4,058 sheep were killed, and 3,948 injured. In 1954 this number had risen to 5,459 killed and 4,325 injured. An article in the *Police Journal* has described the work of local officers, assisted by the Forensic Science laboratory at New Scotland Yard, in identifying three dogs who had attacked 24 ewes so savagely that they had to be destroyed. The owners of the dogs were summonsed, and on being found guilty were ordered to keep the dogs under control—a sentence which seems to have erred, to put it mildly, on the side of leniency.

PIG PROGENY TESTING

While the National Pig Progeny Testing Board awaits the completion of the formalities of registration under the Companies Act, the members designate are functioning as a provisional board. They have appointed an advisory committee on management, feeding and animal health at the stations, on carcase appraisal and on questions involving genetics and statistics such as the pre-selection of boars for test. This committee will be under the chairmanship of Dr. John Hammond, and includes Professor M. M. Cooper, Dean of Agriculture, Durham University; Mr. W. P. Dodgson, Chief Livestock Husbandry Officer of the Ministry of Agriculture; Mr. H. I. Field, M.R.C.V.S., a member of the Veterinary Staff of the Ministry of Agriculture; Mr. G. Harrington of the Agricultural Research Council's Statistics Group attached to the School of Agriculture, Cambridge; Mr. A. I. McK. Lucas of the Rowett Research Institute; Mr. R. W. Pomeroy of the A.R.C.'s staff, at present attached to the School of Agriculture, Cambridge, and Dr. Alan Robertson of the Institute of Animal Genetics, Edinburgh.

FOOT-AND-MOUTH DISEASE

Restrictions on the movement and marketing of live-stock in the Infected Area around Litton Cheney, Dorset, have been withdrawn as from July 16th, 1956.

The outbreak in this area involved the slaughter of 100 cattle, 467 sheep, and 22 pigs.

UNIVERSITY NEWS

Glasgow

At a graduation ceremony held on July 7th at the University of Glasgow, the following students were awarded the degree of Bachelor of Veterinary Medicine and Surgery. Mr. H. C. Wilson graduated with honours, and Messrs. R. G. Dalton and D. C. Taylor with commendation.

Aitken, John P.; Allison, Colin J.; Anderson, Ronald S. (distinction medicine); Baillie, Alexander D.; Bremner, Alan S.; Brown, David R. (distinction surgery); Campbell, Samuel, G.; Christie, Geoffrey C.; Craig, Gordon R.; Dalton, Rodger G. (distinction medicine); D'Cruz, Samuel; Duckett, Mary; Dykes, Agnes B.; Fitchie, Peter; Jones, Alun S.; Le Riche, Philip D.; Martin, Bernard; Murray-Brown, Ian F.; Newton, Keith; Parsonage, John P.; Pepper, Thomas A.; Ratcliffe, James; Sharp, Norman C. C.; Sinclair, James D.; Smith, Robert H. A.; Smith, Thomas S.; Sutherland, James S. (distinction medicine); Sutherland, Roderick; Taylor, David C. (distinction surgery); Taylor, John N.; Warnock, James P.; Wilson, George P. H.; Wilson, Harry C. (distinction medicine and surgery); Wood, David R., and Yates, Robert N.

The graduates were received into the Royal College of Veterinary Surgeons by Professor Pugh, the President, at a short ceremony held in the Veterinary Hospital.

DOCTORATE AWARDED

Mr. John C. Greatorex has been awarded the Ph.D. degree of the University of Reading. It was conferred upon him on July 7th. The title of his Thesis was: *Observations on the Haematology of Calves and Various Breeds of Adult Dairy Cattle.*

R.C.V.S. EXAMINATION RESULTS

Dublin

SECOND EXAMINATION

Physiology and Anatomy

Browne, F. T.; Browne, H. G.; Byrne, J. F. (P); Coad, B. P.; Condon, J. C.; Corry, E.; Hassett, J. L.; Lucas, K.; Lynch, P.; McCarthy, Wm.; *McDonald, T. O.; McHenry, D. F.; McParland, P. J.; Maughan, P. T.; Nolan, V.; Nyhan, J. F.; O'Neill, Patrick; Sharpe, P. (P); Sherrard, J. C., and Wall, Henry (A).

* denotes 2nd Class Honours.
(P) denotes credit in Physiology.
(A) denotes credit in Anatomy.

Physiology only

Boothman, J. H.; Boyce, M. W.; Collins, T. D.; Demery, V. W.; Flanagan, P. D.; Flannery, Donald; Hewitt, M. P.; Keane, D. C.; Lynch, M. E.; McAuliffe, M. J.; Pierse, J. D., and Wilson, R. W.

Anatomy only

Callanan, C.; Cooney, M. A.; Corr, C. J.; Grealy, M. J.; Hand, P. J.; O'Mahony, D. J., and Ryan, H. V.

THIRD EXAMINATION

Hygiene only

Cousins, F. G. O.; Duffy, E. F.; Gaffney, W. M. N.; Gormley, B. A.; Harrington, D. P.; Kenny, M. P.; Lawlor, Florence; Leslie, N. W.; Lowndes, J. D.; Lydon, C. T. J.; Lyons, Valentine; McKervey, J. H.; McKinley, P. J.; Murray-Hayden, P. J.; O'Leary, Michael; Prendergast, M. J. G.; Smith, F. M.; Smyth, J. J., and White, J. E. C.

Pathology only

Byrne, C. J.; Cooney, J. F.; Costello, E. A.; Crowe, J. F.; Denver, K.; Doherty, P. L.; Gibney, E. E.; Jones, R. F.; Keane, M. J.; McCarthy, Wm.; McGilligan, C. A.; McLaughlin, David; Maloney, Patrick; Mansfield, M. P.; Martin, W. H.; Moloney, J. B.; Mulvey, W. J.; Rispin, K., and Smyth, D. J. (Credit).

FINAL EXAMINATION

Allen, R. S.; Barnes, Thomas; Broderick, T. I.; Cody, O. H.; Cotter, Wm.; Daly, D. J.; Deboys, D. C.; Ennis, Miss D. M.; Evans, J. A.; Handcock, W. J.; Hurley, J. D.; Hurley, T. J.; Kent, D. K.; Lee, J. G.; Nolan, P. J.; O'Connor, J. J.; O'Neill, T. J.; O'Neill, W. J.; Ryan, M. A.; Teevan, R. J. (M), and Wilson, D. J.

(M) denotes credit in Medicine.

THE REGISTER OF VETERINARY SURGEONS

The names of the following members have been removed, at their request, from the Register of Veterinary Surgeons with effect from July 5th, 1956:—

Atkinson, William Thomas Styan, 65, North Road, Brighton, 1; Cooke, Alfred, 118, St. Margaret's Road, Edgware, Middx.; Durrant, George, The Manor House, Lytchett Matravers, Poole, Dorset; Hart, Rupert Lancelot Leon, Kaya, Midella Road, Yelverton, Devon; Pugh, Thomas Walter Eric, 4, Pembroke Road, Sevenoaks, Kent; Roberts, Ida, The Manor House, Lytchett Matravers, Poole, Dorset; Willows, George Thomas, 1, Owens Road, Winchester, Hants, and Wynne, John Henry, Vaynol, Denbigh.

The name of Mr. David Brown Johnson McCall, of Florida Road, Durban, South Africa, has been restored to the Register.

R.C.V.S. OBITUARY

We record with regret the death of the following member of the profession:—

BEGG, George Warnock, 48, Winchester Road, Andover, Hants, Capt. R.A.V.C. (T.A.R.O.) (Retd.). Graduated Glasgow, July 21st, 1923. Died July 5th, 1956, aged 55 years.

PERSONAL

Births

ABRAHAM.—On June 26th, 1956, at the British Military Hospital, Tripoli, to Lyn, wife of Captain B. F. Abraham, M.R.C.V.S., R.A.V.C., a daughter.

BEATTIE.—On July 8th, 1956, to Vivienne, wife of Frank W. Beattie, M.R.C.V.S., of 196, Woodcote Road, Wallington, Surrey, a son, Michael John.

LEFTWICH.—On July 2nd, 1956, at Southend House, Ockham, to Bridget, wife of Richard Leftwich, M.R.C.V.S., a son.

SMITHSON.—On July 13th, 1956, to Margaret (*née* Smith) wife of T. Brian Smithson, M.R.C.V.S., of "Westbrook," South Avenue, Elstow, Beds, a son, Martin Thomas.

Marriages

BALDWIN—SMITH.—On June 23rd, 1956, at St. Mary's Church, Bitteswell, Nr. Rugby, Ivor John Baldwin, M.R.C.V.S., son of Mr. and Mrs. E. G. Baldwin, Rugby, to Ann Elizabeth, daughter of Mr. and Mrs. A. C. Smith, The Elms, Bitteswell, Nr. Rugby.

FRY—SEADEN.—The wedding took place on June 30th, 1956, at Keynsham Parish Church, Somerset, of Norman Charles, M.R.C.V.S., Lecturer in Animal Health and Veterinary Science at the University College of the Gold Coast, only son of Mr. and Mrs. C. H. Fry of Charlton Park, Keynsham, to Rosemary Frances, only daughter of O/Cdr. and Mrs. J. H. G. Seaden of Copse Road, Keynsham.

COMING EVENTS

July

28th (Sat.). Annual reunion of the R.V.C. '52 Club at Ye Miller of Mansfield, Goring.

September

16th to 22nd (Sun. to Sat.). 74th B.V.A. Annual Congress at Royal Leamington Spa.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Angus. Fotheringham Home Farm, Forfar (July 10).
Ches. Windy Arbour Farm, Nantwich (July 11).
Derby. Belle Vue Farm, Hollington, Derby (July 6).
Lancs. Israels Farm, Over Hulton, Bolton (July 11).

Northumberland. Sunilaws Farm, Cornhill-on-Tweed (July 6).
Somerset. Batch Farm, Lympsham, Weston-super-Mare (July 12).
Staffs. Park Lane Farm, Knypersley, Biddulph, Stoke-on-Trent (July 9).
Suffolk. Hall Farm, Carlton Colville, Lowestoft (July 6).
Warwicks. Couchmans Farm, Meriden, Coventry (July 12).
Yorks. Barton Cottage, Ouseburn (July 10).

Fowl Pest

Lancs. Oak Tree Poultry Farm, Brinscall, Chorley; Crossehall Mill Farm, Crossehall Lane, Chorley; Wilson Nook Farm, Town Lane, Whittle-le-Woods, Chorley (July 9); Higher Copthurst Farm, Whittle-le-Woods, Chorley (July 12).
Lincs. 83, Rectory Road, Ruskington, Sleaford; Church Lane, Cherry Willingham, Lincoln (July 9); 49, High Street, Heckington; 55, Rectory Road, Ruskington; Halfleet, Sleaford Road, Heckington, Sleaford (July 12).
Northants. Orton House, Rothwell, Kettering (July 11).

Swine Fever

Bucks. Rectory Farm, Salford, Bletchley; 190, High Street, Cranfield, Bletchley (July 11).
Berks. Smallholding, Upper Road, Kennington (July 12).
Ches. Hall-o-Coole, Newhall, Nantwich (July 12).
Devon. Knighthayne Farm, Yarcombe, Honiton (July 12); Nethereaux Farm, Halberton (July 16).
Dunbarton. Tarbet Hotel, Arrochar (July 10).
Essex. Church Farm, Hempstead, Saffron Walden (July 16).
Lancs. Lower Ridge Piggeries, Belvedere Road, Burnley (July 10).
Lincs. Laburnham Farm, Skidbrooke, Saltfleet, Louth (July 16).
Salop. New House Farm, Leebotwood, Shrewsbury (July 12).
Staffs. Shortwood Farm, Standon (July 11); Grove Farm, The Nest, Pelsall, Walsall (July 12).
Somerset. The Lodge, East Street, Martock (July 12).
Yorks. Corner House, Woodmansey, Beverley (July 16).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Use of Transverse Screws in Fracture Fixation

Sir,—It was with great interest that I read the article on the use of transverse screws in fracture fixation by Mr. G. C. Knight, who has shown that he is not merely content to rest on his laurels as the pioneer of internal fixation of fractures in this country, but is actively working on the problems which were not solved by his previous publications.

I was especially interested to read of Mr. Knight's recent work as I have also been seeking solutions to these problems.

In certain cases, such as high fractures of the ulna, I believe that the use of an " olecranon " screw has some advantages. It is constructed with a wide thread and a narrower non-threaded shaft, and this construction ensures that impaction of the fracture site occurs despite the distracting effect of the muscles. This screw obtains much the same effect as Mr. Knight did by drilling the proximal portion oversize.

I have found that the use of " Rush " pins is helpful, especially near joints and in such sites as distal epiphyseal fracture of the femur they afford secure fixation without fear of rupture of the trochlea groove and without interference with the femoro patellar joint surface. I am currently preparing an article on this subject.

Yours faithfully,
DONALD D. LAWSON.

University of Glasgow Veterinary School,
Veterinary Hospital,
Bearsden Road,
Bearsden,
Glasgow.
July 9th, 1956.

Handsome Does as Handsome Is

Sir,—Recently a poor (?) person in this district took his dog to a clinic run by a welfare society. When he told me this, I mentioned that the person he saw was not a qualified veterinary surgeon. " Oh yes, he was," said my visitor. " He had a white coat!"

Yours faithfully,
F. V. EDWARDS.

Woodhouse Eaves,
Stokenham,
Kingsbridge,
S. Devon.
July 12th, 1956.

ADVERTISER'S ANNOUNCEMENT
IMPERIAL CHEMICAL (PHARMACEUTICALS) LIMITED announce that they have now introduced " Stromez " Streptomycin/" Sulphamezathine " Dispersible Powder for the prevention and treatment of enteritis in all species. " Stromez " is presented in 100-gramme envelopes packed in boxes of five.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period			Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 30th June, 1956			15	—	1	54	—	37
Corresponding period in	1955		17	1	—	24	—	77
	1954		6	—	—	13	—	103
	1953		20	—	1	135	—	110
1st January to 30th June, 1956			1,018	6	13	323	—	387
Corresponding period in	1955		442	1	6	271	—	848
	1954		150	3	12	541	—	824
	1953		434	—	26	508	—	1,733